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Exercise addiction and disordered eating in young Lebanese regular sport practitioners: the indirect role of body appreciation and body dysmorphic concerns

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Abstract

Background Disordered eating, encompassing behaviors like restrictive dieting, binge eating, and purging, is a prevalent issue with significant psychological and physical consequences. Among athletes, it is often exacerbated by sociocultural pressures and performance demands, making it a critical area of study. Exercise addiction is characterized by compulsive exercise behaviors and is frequently associated with disordered eating; however, the underlying mechanisms of this relationship remain unclear. Limited research has explored the factors that may contribute to the risk of both exercise addiction and disordered eating, particularly in athletes. This study aims to investigate the relationship between exercise addiction and disordered eating in regular sport practitioners and explore the potential indirect roles of body appreciation and body dysmorphic concerns. Examining these constructs is particularly important, as sociocultural pressures and limited mental health resources may uniquely influence their risk factors and experiences.

Methods This was a cross-sectional study enrolling 321 Lebanese regular sport practitioners (mean age of 21.09 years with 51.2% males) currently residing in Lebanon.. The questionnaire consisted of four scales, validated in Arabic: the Eating Attitudes Test, the Body Appreciation Scale, Exercise Addiction Inventory—Youth, and the Dysmorphic Concern Questionnaire.

Results Body appreciation explained a significant amount of the variance in the association between exercise addiction and disordered eating; higher exercise addiction was significantly associated with lower body appreciation and directly associated with more disordered eating. Moreover, higher body appreciation was significantly associated with less disordered eating. Furthermore, body dysmorphic concerns explained a significant amount of variance in the association between exercise addiction and disordered eating; higher exercise addiction was significantly associated with more body dysmorphic concerns and directly associated with more disordered eating. Additionally, higher body dysmorphic concerns were significantly associated with more disordered eating.

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Conclusion The study examines the significant indirect role of body dysmorphic concerns and body appreciation between exercise addiction and disordered eating in young adult athletes. These findings underscore the need for interventions targeting body dysmorphic concerns and body appreciation in addressing exercise addiction and disordered eating. By fostering a positive body image and reducing maladaptive behaviors, this can guide coaches and trainers in creating supportive, body positive environments that prioritize athletes' mental and physical well-being.

Plain English Summary

Exercise addiction, defined by compulsive exercise behaviors, is closely linked to disordered eating behaviors such as restrictive dieting, binge eating, and purging that carry serious psychological and physical risks. In sport practitioners, these issues can be intensified by the pressures of performance and sociocultural expectations. In this study we explored how body image plays a role in this relationship by examining both positive aspects of body image (body appreciation) and negative concerns (body dysmorphic concerns). Our findings suggest that regular sport practitioners with higher exercise addiction tend to have lower body appreciation and higher body dysmorphic concerns, factors that in turn are associated with greater disordered eating. These insights underscore the importance of fostering a positive body image and addressing appearance-related concerns to help reduce disordered eating behaviors among sport practitioners.

Keywords Disordered eating, Exercise addiction, Body appreciation, Body dysmorphic concerns

Background

Disordered eating encompasses, but is not limited to, restricted or excessive food consumption, loss of control over eating, and purging (e.g., self-induced vomiting), and can be associated with negative emotions such as guilt, shame or physical discomfort [1]. It includes eating behaviors that restrict food choices, minimize or exaggerate food consumption, result in physical discomfort, generate a sense of loss of control, or give rise to negative emotions like guilt or shame [2]. Therefore, disordered eating is a subclinical presentation of an eating disorder that may create a state of distress and be maladaptive for the individual [3].

The prevalence of exercise addiction varies by sport type and assessment techniques, ranging from 3 to 42% [4]. This broad range highlights the influence of sport classification on disordered eating risk. Specifically, individuals engaged in sports that emphasize leanness or aesthetics—such as gymnastics, figure skating, and diving—experience higher pressures related to body image and weight control, leading to increased prevalence compared to those in non-aesthetic or team-based sports (e.g., soccer, basketball) [5–7]. It has also been shown that 42% of female athletes in aesthetics sports experienced disordered eating patterns and behaviors [7].

A recent study suggests that among regular sport practitioners, an elevated Body Mass Index (BMI) is associated with a higher risk of disordered eating behaviors, particularly restrictive and binge eating [8, 9]. This link appears to be driven by increased body dissatisfaction and psychological stress, which contribute to the development of maladaptive eating patterns [10, 11]. Other studies found that socioeconomic status is a key predictor of disordered eating, with lower status linked to binge eating due to stress and lack of control, while higher status is associated with restrictive eating driven by pressure to maintain thinness [12, 13].

Given this, it is significant to identify disordered eating as it can progress to an eating disorder which in turn has many physical and psychological consequences such as mood, anxiety and substance use disorders [14, 15]. These consequences might extend among regular sport practitioners to serious health complications such as Relative Energy Deficiency in Sport (RED-S), which can negatively impact metabolism, bone health, and overall well-being [16].

Exercise addiction and disordered eating

Within Lebanon, there are particular societal and cultural pressures, including pressure from sports culture, appearance ideals, and feedback from teammates and coaches, that contribute to the risk of disordered eating [17, 18]. Psychological factors such as stress due to competitive demands also play a large role according to a recent study [19]. Moreover, exercise addiction is often accompanied by dietary restrictions and compulsion to exercise as a way to maintain or lose weight [20].

Exercise addiction is defined as a behavioral addiction which includes losing control over exercise activities and can be a part of compulsive exercise patterns that are used to manage emotions like escalating exercise intensity to reach a"high" [4]. This maladaptive practice is characterized by excessive training volumes, causing physical harm and absence of control over the fitness

program. Individuals with exercise addiction can also experience conflict in their personal lives particularly with family members [21]. Health concerns, anxiety, depression, and coexisting eating disorders are frequently associated with exercise addiction [4].

There is a well-established association between exercise addiction and disordered eating. A strong focus on body image can lead to unhealthy eating behaviors through multiple mechanisms and external pressures [20]. It has been shown that the chance of ever being diagnosed with an eating disorder is 2.5 times higher for individuals who excessively exercise compared to those with lower activity levels [22]. An association between exercise addiction and disordered eating was also highlighted since exercise addiction almost always occurs accompanied by a preoccupation with body image particularly in individuals engaged in activities or environments that emphasize appearance or performance [5, 20]. This preoccupation is the primary motive behind disordered eating behavior particularly among certain sport practitioners who face body-related expectation [5, 20]. Adding to that, the social pressure and competitive drive sport practitioners experience often reinforce the belief that weight loss and excessive training enhance performance, leading to disordered eating and exercise addiction in many sport practitioners [18]. Furthermore, eating disorders and exercise addiction potentially share common neurobiological pathways particularly in reward and addictions circuits which may explain their link and coexistence [23].

Indirect effect of body appreciation and body dysmorphic concerns

The association between exercise addiction and disordered eating behaviors may be further explained through the indirect effects of psychological constructs like body appreciation and body dysmorphic concerns, which shape how individuals perceive and engage with their bodies. Body dysmorphic concerns refer to preoccupation with imagined or minimally noticeable physical appearance flaws which are generally not visible or appear insignificant [24, 25]. It is often accompanied by behaviors aimed at coping with distress, social avoidance, and functional impairment [25]. It has been shown that exercise addiction often increases the fixation on body changes and improvement, making individuals more prone to body dysmorphic concerns since they frequently experience dissatisfaction with their appearances [26]. Exercise addiction can also trigger or worsen body dysmorphic concerns, as it often involves continuous comparison with others where such comparisons are common [26, 27]. Additionally, body dysmorphic concerns have also been shown to increase the risk for disordered eating patterns since individuals often engage in restrictive and strict diets in hopes to fix their perceived flaws through extreme eating behaviors [28].

As for the concept of body appreciation, it is defined as accepting, embracing positive attitudes toward, and respecting the body, while also rejecting media-promoted appearance ideals as the only form of beauty [29]. It includes embracing and valuing one's physical self with all its features, health and functions of the body [30]. A previous study found a link between exercise addiction and low body appreciation, as individuals with exercise addiction often feel compelled to achieve an ideal physique. This constant striving can decrease body appreciation, as individuals rarely feel satisfied with their appearance [31, 32]. Furthermore, individuals with exercise addiction often adopt extreme routines and minimize rest, focusing on achieving specific physical goals rather than prioritizing their own wellbeing. This approach can lead to low body appreciation, as exercise becomes a means to an end rather than a source of self-care [20]. Moreover, another study found that individuals with low body appreciation tend to judge their bodies rather than value their physical functionality, which can promote disordered eating behaviors as they strive to achieve an ideal body image [31].

Exercise addiction contributes to disordered eating through multiple pathways, including insomnia, which can worsen mental health and increase dependence on disordered eating as a coping mechanism. [33] Similarly, the psychological distress often associated with exercise addiction further increases vulnerability to maladaptive eating behaviors. [33]

Exploring exercise addiction in Lebanon is important due to societal and cultural pressures that emphasize appearance, often creating a strong drive to maintain certain body ideals. This pressure can contribute to the development of exercise addiction [34]. A study showed that dissatisfaction and concerns about physical appearance and shape is on the rise in Arab countries which makes it important to address this issue [25, 34]. Additionally, limited awareness and support for mental health issues like exercise addiction—often overlooked because exercise is generally seen as a healthy habit—make it essential to address and bring attention to this problem [35]. Moreover, the notable presence of eating disorders in Lebanon emphasizes a crucial need to address sociocultural pressures that highlight the thin ideal, especially for young sport practitioners [35]. Furthermore, Lebanese people are regularly exposed to economic and political stressors, which increase the likelihood of unhealthy coping mechanisms, such as disordered eating and compulsive exercise [36]. Likewise, due to Lebanon's sociocultural pressures and limited access to mental health resources, Lebanese are at higher risk for body image

issues and associated disordered eating patterns. These often go untreated highlighting the need for targeted research and interventions to address body dysmorphic concerns and disordered eating, especially with the influence of Westernized body ideals in Lebanon [34].

Therefore, this research aims to evaluate the indirect effect of body dysmorphic concerns and body appreciation in the association between exercise addiction and disordered eating among a sample of Lebanese regular sport practitioners. The study hypothesis suggests that lower levels of body appreciation and higher levels of body dysmorphic concerns may act as intermediate variables between exercise addiction and disordered eating among Lebanese young sport practitioners.

Methods

Study design

This was a cross-sectional designed study, conducted between February and May 2024, and enrolling 321 young adults currently residing in Lebanon, from all Lebanese governorates (Beirut, Mount Lebanon, North, South, and Bekaa). Participants were selected through a snowball sampling method, starting with a few initial regular sport practitioners and expanding through referrals. The larger sample size was chosen to improve statistical power and ensure better subgroup analyses. Inclusion criteria required participants to be Lebanese older than 18, actively engaged in sports, who participate in structured sports training sessions at least three times per week from a range of sports, including endurance, strength-based, and team sports. Google Forms were used to make a soft copy of the questionnaire, and an online approach was developed to continue with the data collecting. Prior to their participation, participants received online instructions on how to complete the questionnaire as well as the primary aims and objectives of the study. Later, initial participants were asked to recruit other participants they know that are regular sport practitioners as well, preferably as diverse as possible in terms of place of habitat within the Lebanese governorates and within the same age interval required to participate in the study. There were no credits received for participation.

Minimal sample size

A minimal sample of 123 was deemed necessary using the formula suggested by Fritz and MacKinnon [37] to estimate the sample size: $= \frac{L}{f^2} + k + 1$, where f = 0.26 for small-to-moderate effect size, L = 7.85 for an α error of 5% and power β = 80%, and k = 6 variables to be entered in the model.

Questionnaire

The first part of the questionnaire, developed in Arabic, comprised an explanation of the study's topic and objectives. A statement was provided to assure respondents about the anonymity of their participation. Additionally, participants were informed of the importance of providing their informed consent prior to engaging in the study. The second section of the questionnaire encompassed the collection of sociodemographic information from participants such as age and sex, as well as self-reported current weight and height. Subsequently, the Body Mass Index (BMI) was computed according to the World Health Organization (WHO) guideline [38]. The Household Crowding Index, which serves as an indicator of the family's socioeconomic status was calculated as the ratio of the total number of individuals residing in the household to the total number of rooms within the dwelling (excluding kitchens and bathrooms) [39]. The physical activity index is determined by the combined result of daily activity intensity, duration, and frequency. It serves as a comprehensive measure to assess individuals' overall physical activity levels [40]. The third part included the scales used in this study.

The Arabic validated version of *the Eating Attitudes Test* (EAT-7) [41] was used to assess eating attitudes. This scale, through its seven items, measures symptoms and concerns characteristic of eating disorders, with responses varying from 0 (never) to 3 (always) (e.g., "Avoid eating when I am hungry"). Higher scores indicate more inappropriate eating attitudes (Cronbach's α = 0.87).

The Arabic validated version of the *Body Appreciation Scale* (BAS-2) [29]was used to assess body appreciation which is the intermediate variable. This 10-item instrument evaluates acceptance of one's body, respect and care for one's body, and protection of one's body from unrealistic beauty standards. Items are rated on a 5-point scale (*never* to *always*). Higher scores on this scale reflect greater body appreciation (Cronbach's α = 0.95).

Exercise Dependence Scale (EDS-21) [42].

It is composed of 21 items rated on a 6-point Likert scale (1 = never to 6 = always), with higher scores reflecting more exercise dependence. This scale was validated in Arabic among the Lebanese population [43] (Cronbach's α = 0.95).

The Dysmorphic Concern Questionnaire (DCQ), validated in Arabic [25], encompasses seven self-report items aimed at assessing an individual's degree of dysmorphic concern. Respondents rate their level of distress and concern on a Likert-type scale, ranging from"Not at all"to"Extremely."Scores are calculated by summing the item ratings, with higher scores indicating higher body dysmorphic concern. Examples of items inquire about

distress regarding facial appearance, interaction with daily life, and frequency of appearance-related thoughts (e.g. Considered yourself misformed or misshapen in some way (e.g., nose/hair/skin/sexual organs/overall body build) [44]. (Cronbach's α = 0.87).

Statistical analyses

No missing data was found in our database since all questions were required.

Data analysis was performed using the SPSS software version 25. Reliability was checked using Cronbach's alpha values for the used scales. The EAT-7, BAS-2, DCQ and EA scores had a normal distribution as shown by the skewness and kurtosis values varying between ± 2. The Student t-test was used to compare continuous variables between two groups, and Pearson correlation was used for linear correlation between continuous variables. The PROCESS SPSS Macro version 3.4, model four was used to calculate three pathways [99]. Pathway A determined the effect of the exercise addiction on body appreciation/body dysmorphic concerns; Pathway B examined the association between body appreciation/body dysmorphic concerns and disordered eating, and Pathways C and C' estimated the total direct effect of exercise addiction on disordered eating. Significance was deemed present if the Bootstrapped confidence interval did not pass by zero [45]. Covariates entered in the mediation analysis were variables that showed a $p < 0.25$ in the bivariate analysis. Significance was set at $p < 0.05$.

Table 1 Sociodemographic characteristics of the participants (n = 321)

Variable	n (%)
Sex	
Male	161 (50.2%)
Female	160 (49.8%)
Age (years)	21.09 ± 1.91
Household crowding index (person/room)	0.66 ± 0.34
Body Mass Index (kg/m^2)	23.09 ± 3.07
Physical activity	52.11 ± 15.97
Disordered eating	4.93 ± 5.19
Body appreciation	32.08 ± 8.65
Body dysmorphic concerns	2.61 ± 3.19
Exercise addiction	82.36 ± 18.77

Results

Three hundred and twenty-one Lebanese regular sport practitioners enrolled in this study with a mean age of 21.09 years (SD = 1.91) and 49.8% females. Other details pertaining to the sample can be found in Table 1.

Bivariate analysis

A higher mean EAT-7 score was significantly found in females compared to males (6.94 ± 5.51 vs 2.94 ± 3.97, t(319) = − 7.45, $p < 0.001$). Higher BMI and body appreciation were significantly associated with lower EAT scores (less disordered eating), whereas higher physical activity and body dysmorphic concerns were significantly associated with higher EAT scores (more disordered eating) (Table 2).

Mediation analysis

The results of the mediation analysis were adjusted over the following variables: sex, household crowding index, BMI and physical activity. Body appreciation explained a significant amount of the variance in the association between exercise addiction and disordered eating (indirect effect: Beta = 0.06; Boot SE = 0.01; Boot CI 0.04; 0.08). Higher exercise addiction was significantly associated with lower body appreciation and directly associated with more disordered eating. Moreover, higher body appreciation was significantly associated with less disordered eating (Fig. 1).

Moreover, body dysmorphic concerns explained a significant amount of the variance in the association between exercise addiction and disordered eating (indirect effect: Beta = 0.05; Boot SE = 0.01; Boot CI 0.03; 0.07). Higher exercise addiction was significantly associated with more body dysmorphic concerns and directly

Table 2 Bivariate analysis of continuous variables associated with disordered eating

	1	2	3	4	5	6
1. Disordered eating	1					
2. Age	0.03	1				
3. Household crowding index	0.10	0.29***	1			
4. Body Mass Index	− 0.39***	0.03	− 0.13*	1		
5. Physical activity	0.40***	− 0.05	− 0.10	− 0.07	1	
6. Body appreciation	− 0.65***	0.07	− 0.08	0.36***	− 0.06	1
7. Body dysmorphic concerns	0.67***	0.10	0.29***	− 0.42***	0.15**	− 0.70***

* $p < .05$; ** $p < .01$; *** $p < .001$

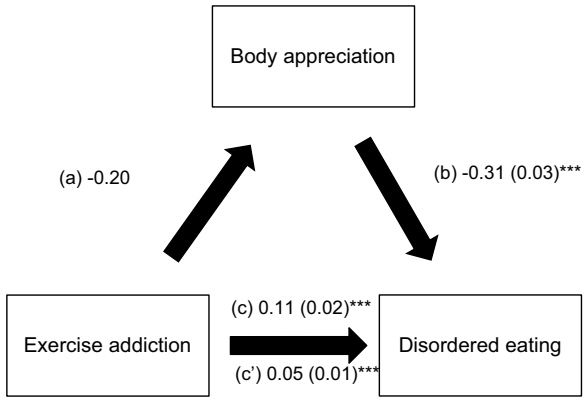

Fig. 1 **a** Relation between exercise addiction and body appreciation (R^2 =.264); **b** Relation between body appreciation and disordered eating (R^2 =.595); **c** Total effect of exercise addiction on disordered eating ($R.^2$ =.403); **c** Direct effect of exercise addiction on disordered eating. Numbers are displayed as regression coefficients (standard error). ***$p < 0.001$

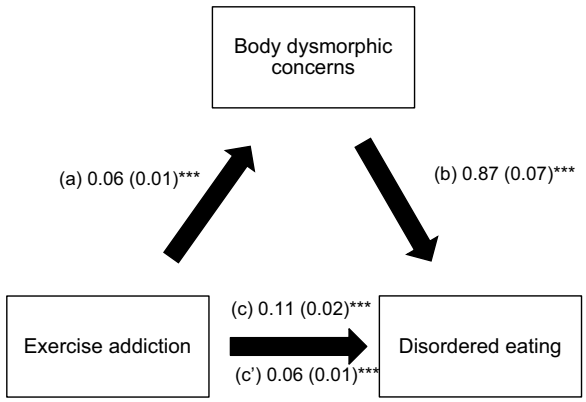

Fig. 2 **a** Relation between exercise addiction and body dysmorphic concerns (R^2 =.338); **b** Relation between body dysmorhic concerns and disordered eating (R^2 =.590); **c** Total effect of exercise addiction on disordered eating ($R.^2$ =.403); **c** Direct effect of exercise addiction on disordered eating. Numbers are displayed as regression coefficients (standard error). ***p < 0.001

associated with more disordered eating. Moreover, higher body dysmorphic concerns were significantly associated with more disordered eating (Fig. 2).

Discussion

The objective of this study was to assess the relationship between exercise addiction and disordered eating, along with the indirect effect of body appreciation and body dysmorphic concerns among Lebanese young adult regular sport practitioners. Our findings revealed a significant positive effect of exercise addiction on disordered eating. In addition, the results of the mediation analysis showed that body appreciation and dysmorphic concerns had significant indirect effects on the association between exercise addiction and disordered eating.

The association between exercise addiction and disordered eating

The current study demonstrated that higher exercise addiction was significantly associated with higher disordered eating. Our findings align with evidence suggesting that unhealthy, excessive exercising plays a key role in the psychopathology of disordered eating within diverse sport practitioners' samples, either with or without the intervention of third variables [22]. Regular sport practitioners are at risk for exercise dependence [46] that, in turn, can increase their vulnerability to disordered eating [47]. In support of these observations, research noticed that excessive exercise predicts 2.5-fold increased odds of an eating disorder diagnosis in excessive exercisers compared to irregular exercisers [48].Exercise may be viewed as a primary strategy to achieve a lean physique [9]. This focus often leads to exercise addiction, accompanied by disordered eating behaviors, as individuals attempt to reach their goal more quickly [22]. Additionally, exercise addiction can lead to disordered eating by encouraging sport practitioners to restrict their food intake in an effort to maximize and enhance the results of their exercise [22]. Another study found that excessive exercise often involves maladaptive compensatory behaviors, such as exercising to burn off calories or"earn"food. These behaviors are commonly associated with restrictive eating or binge-purge patterns, which are often seen in eating disorders [4]. Moreover, exercise addiction often stems from societal ideals surrounding physical appearance and athletic success; this creates pressure to maintain a body image that is admired and valued by others, leading individuals to adopt disordered eating behaviors in an attempt to meet these external expectations. [5]

The indirect effect of body dysmorphic concerns

The current study demonstrated that higher exercise addiction was significantly associated with higher dysmorphic concerns. This finding aligns with the results of previous research showing that individuals with exercise addiction often set unrealistic expectations for their ideal body image [49]. This perfectionistic drive can lead them to focus on minor or even imagined imperfections, contributing to body dysmorphic concerns. Regular sport practitioners with exercise addiction frequently compare themselves and are influenced by the physical body ideals promoted in sports which are often unrealistic, leading to dissatisfaction in one's physical appearance and increasing the risk of body dysmorphic concerns [26]. Additionally, people with exercise addiction focus on ideal body goals rather than health or entertainment which serves as

fuel for body dysmorphic concerns as their self-worth is related to reaching a physique goal [26].

On the other hand, individuals with body dysmorphic concerns often feel the need to correct their perceived flaws, which frequently leads to restrictive eating as a means to achieve their ideal body. As a result, they may rely on strict dietary controls as a way to manage their body dysmorphic concerns [28]. Another study found that regular sport practitioners sometimes use symmetrical body appearance as a measure of their success, prompting them to resort to abnormal eating behaviors in order to achieve their goals [50]. This tendency contributes to an increase in disordered eating among regular sport practitioners. Moreover, individuals suffering from body dysmorphic concerns often experience social embarrassment due to heightened self-consciousness, which can lead to social isolation. In turn, this isolation may encourage the development of disordered eating behaviors as a coping mechanism [30]. Altogether, our findings support that although a significant association was evidenced between maladaptive exercise behavior and disordered eating, there seems to be a large amount of eating pathology that is not explained by exercise dependence. Hence, there remains a persistent need for research exploring pathways leading to disordered eating in regular sport practitioners [28].

Indirect effect of body appreciation

The present study found that higher exercise addiction was significantly associated with lower body appreciation, and higher body appreciation was significantly associated with more disordered eating. This aligns with the results of a previous study, which found that exercise addiction intensifies the fixation on perceived flaws, thereby reducing body appreciation [26]. In this context, exercise becomes a compulsive tool for progress and improvement, rather than a practice aimed at overall wellbeing. Another study found that regular sport practitioners with exercise addiction often demonstrate increased body comparison, which commonly leads to lower body appreciation [51]. Moreover, nowadays social media frequently promotes body objectification, giving rise to exercise addiction and reinforcing dissatisfaction when the physiques diverge from the unrealistic goals contributing to lower body appreciation [26]. However, some studies found that those at risk of exercise addiction showed a notable increase in body appreciation, suggesting that the direct positive effect exercise on body image might encourage addictive exercise behaviors [52].

On the other hand, a previous study showed that regular sport practitioners, such as athletes, often face external pressure to achieve an ideal body, and low body appreciation intensifies this stress [53]. This pressure can lead to disordered eating behaviors as a way to exert control over their bodies. Also, regular sport practitioners, especially in high performance settings, often compare themselves to other competitors which can reduce body appreciation and promote disordered eating as they attempt to live up to these unrealistic standards [53]. Additionally, a study indicated that increased body appreciation can serve as a buffer against external pressures; regular sport practitioners who value and honor their bodies, prioritizing performance and strength over appearance, tend to exhibit lower levels of disordered eating behaviors. [54]

Clinical implications

There are several clinical implications gleaned from understanding the relationships between exercise addiction, disordered eating, body dysmorphic concerns and body appreciation in this group.. First, understanding how exercise addiction, body dysmorphic concerns and body appreciation influence and affect each other can help design interventions that target the psychological origin rather than only the physical symptoms of disordered eating. For example, targeting low body appreciation may decrease the risk of disordered eating, especially among regular sport practitioners suffering from body related performance pressures. Also, the study can guide approaches for coaches and trainers to build supportive environments that reinforce and encourage healthy body appearance, decreasing the risk of both exercise addiction and disordered eating.

Strengths and limitations

The study's credibility is reinforced by many key strengths that amplify its contribution. The inclusion of a large sample size of 321 regular sport practitioners increases the statistical power and reliability of our findings. Additionally, the use of validated screening tools in Arabic ensures linguistic and cultural appropriateness, enhancing the accuracy of data collection and reducing potential biases. However, our study is not without limitation. First, the study design is cross-sectional which limits our capacity to establish causality and temporal relationships between the variables studied. In addition, the study was based on self-reported questionnaires, which could introduce social desirability bias. There is also the potential for information bias, as participants may provide inaccurate or misleading responses.

Conclusion

The results indicate that body dysmorphic concerns and body appreciation function may be key mechanisms linking exercise addiction and disordered eating in young adult regular sport practitioners. The findings provide evidence

of an association between exercise addiction and disordered eating in young adult regular sport practitioners, highlighting the importance of body dysmorphic concerns and body appreciation as intermediate variables. These outcomes lay the groundwork for future studies examining the interaction between exercise addiction, disordered eating, body dysmorphic concerns, and body appreciation across different populations. Future research with a larger and more diverse sample is needed to further explore these relationships. Additionally, studies in other countries could determine whether these findings are specific to the local context or have broader applicability.

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Author contributions
MH, FFR and SH designed the study; RK collected the data; MAK drafted the manuscript; CH and NA helped with the writing; SH carried out the analysis and interpreted the results; SO reviewed the final manuscript; all authors gave their consent.

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Availability of data and materials
The data that support the findings of this study are available from the corresponding author but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the ethics committee.

Declarations

Ethics approval and consent to participate
The USEK research ethics committee approved the study protocol: Ethics Certificate number: HCR/EC 2024–030. A written informed consent was considered obtained from each participant when submitting the online form. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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